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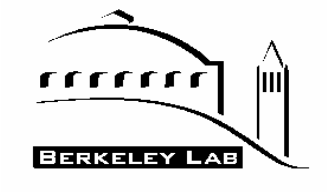

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BERKELEY NATIONAL LABORATORY

ENVIRONMENT, SAFETY, AND HEALTH SELF-ASSESSMENT REPORT FISCAL YEAR 2006

Office of Contract Assurance
Laboratory Directorate
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Executive Summary

Lawrence Berkeley National Laboratory (LBNL) is composed of 16 separate divisions and directorates for Environment, Safety, and Health (ES&H) Self-Assessment. Through division self-assessments as well as Integrated Functional Appraisals (IFAs) and Management of ES&H (MESH) reviews, all divisions sufficiently demonstrated that they have fully implemented and maintained effective integrated safety management (ISM) systems. However, many opportunities for improvement exist.

All divisions participate in the annual Division Self-Assessment. The divisions regularly integrate ES&H considerations into work planning, actively identify and analyze hazards, and effectively control these hazards through administrative and engineering means. LBNL staff performs work safely, and ES&H feedback and improvement mechanisms are robust. The Laboratory's overall performance in fiscal year (FY) 2006 declined from 2005. This is due primarily to unsatisfactory performance in hazard identification, inventory, and analysis; continued difficulties with storing hazardous, radioactive, and mixed waste in compliance with regulatory requirements; and numerous failures to comply with requirements of radiological work authorizations (RWAs) and radiological work permits (RWPs).

Six divisions received IFAs this fiscal year: Chemical Sciences (CSD); Environment, Health, and Safety (EH&S); Genomics; Life Sciences (LSD); Materials Sciences (MSD); and Physics. The 2006 IFAs concluded that, in all five divisions, operations requiring formal authorizations have the appropriate authorizations. In addition, with minor exceptions, divisions followed the requirements established in these authorizations.

The LBNL Safety Review Committee (SRC) performed MESH reviews in four divisions this year: the Advanced Light Source (ALS), CSD, Facilities, and MSD. A MESH review of the Physics Division is in progress. The MESH reviews determined that ISM plans are effectively implemented in all four divisions. In addition, all four divisions have strong management and robust ES&H communications. Since their last MESH, several divisions augmented their systems and/or staff to improve support for line managers in their responsibilities for safety.

The performance-year 2006 self-assessment process noted deficiencies that should be addressed institutionally. Two of the six opportunities for improvement are recommendations repeated from the 2005 self-assessment. In addition, the improvement opportunity on Hazard Identification and Inventory includes unresolved HEAR database issues that were identified in the FY05 Self-Assessment.

1. **Communication of the UC/LBNL Partnership Agreement (formerly the Memorandum of Understanding).** Inspections of Appendix I space on the UC Berkeley campus highlighted continuing issues with ES&H requirements of the Partnership Agreement between LBNL and UC. Divisions remain uncertain of the applicability of DOE requirements, funding to implement those requirements, the definition of work on campus, and their responsibility for ensuring corrective actions to address ES&H findings.

2. **Hazard Identification and Analysis.** Hazard identification and inventory requires improvement, as the Lab lacks a systematic methodology for identifying hazards and inventorying these hazards. Some divisions do not adequately identify and inventory hazards.
3. **Satellite Accumulation Area (SAA) Compliance.** SAA compliance declined for the second consecutive year, with only eight divisions performing at the satisfactory level. The Laboratory must refocus efforts to ensure waste is stored compliantly at generator locations.
4. **Authorization Compliance**. A comprehensive review of Class 3b and 4 laser operations conducted by EH&S Laser Safety Experts identified multiple noncompliances against laser AHD requirements. The 2006 IFAs identified noncompliances with AHD requirements. An increase in work performed under the RWP program, and changes to the noncompliance tracking system, resulted in more noncompliance reports in the RWA, RWP, and X-ray Authorization (XA) programs as compared to recent years. The Laboratory should implement technical assurance systems for ES&H programs, routinely monitor authorization compliance, and continue its efforts to improve the GERT program and to formalize training for Facilities staff and others working under RWPs.
5. **Facilities costs.** The Facilities Division's equipment installation estimates appear negotiable, and the cost of making proper safety modifications is high. Facilities Division's cost and labor estimating process should be reviewed, or a mechanism to bring in outside vendors should be pursued.
6. **Timely corrective action implementation.** Although divisions are extremely diligent in tracking ES&H deficiencies and corrective actions, several struggled to resolve these deficiencies on schedule. In addition, some divisions did not adequately address the opportunities for improvement identified in FY05.

Introduction

LBNL's ES&H Self-Assessment Program ensures that ISM is implemented institutionally and by all divisions. The Self-Assessment Program, managed by the Office of Contract Assurance (OCA), provides for an internal evaluation of all ES&H programs and systems at LBNL. The functions of the program are to ensure that work is conducted safely, and with minimal negative impact to workers, the public, and the environment. The program is composed of four distinct assessments: the Division Self-Assessment, IFA, the MESH review, and the Appendix B Self-Assessment.

The Division Self-Assessment uses the five core functions and seven guiding principles of ISM as the basis of evaluation. Metrics are created to measure performance in fulfilling ISM core functions and guiding principles as well as promoting compliance with applicable regulations.

The five core functions of ISM are as follows:

1. Define the Scope of Work
2. Identify and Analyze Hazards
3. Control the Hazards
4. Perform the Work
5. Feedback and Improvement

The seven guiding principles of ISM are as follows:

1. Line Management Responsibility for ES&H
2. Clear Roles and Responsibilities
3. Competence Commensurate with Responsibilities
4. Balanced Priorities
5. Identification of EH&S Standards and Requirements
6. Hazard Controls Tailored to the Work Performed
7. Operations Authorization

Performance indicators are developed by consensus with OCA, division representatives, and EH&S Division program managers. Line management of each division performs the Division Self-Assessment annually. The focus of the review is workplace safety.

The IFA is an in-depth ES&H technical review of division work activities and operations. The focus of the IFA is on higher-hazard work, particularly work requiring formal authorizations. The assessment concentrates on adequacy of authorizations, effective control of hazards, balance of operation and safety priorities, and applicability of institutional standards and regulatory requirements. The IFA is conducted by EH&S Division technical experts. Each division receives an IFA triennially.

The MESH review is an evaluation of division management of ES&H in its research and operations, focusing on implementation and effectiveness of the division's ISM plan. It is a peer review performed by members of the LBNL SRC, with staff support from OCA. The SRC includes representatives of each science and operations division at

LBNL. Each division receives a MESH review every two to four years, depending on the results of the previous review.

The Appendix B Performance Evaluation and Measurement Plan (PEMP) requires that the Laboratory sustains and enhances the effectiveness of integrated safety, health, and environmental protection through a strong and well-deployed system. As the division self-assessment assesses the implementation of each division's integrated ES&H system, this information is used in the Appendix B assessment. Additional information required for Appendix B is provided by EH&S Division functional managers. The annual Appendix B report is submitted at the close of the fiscal year. This assessment is the DOE's primary mechanism for evaluating the Laboratory's contract performance in ISM.

Throughout the following discussion, the following abbreviations are used for certain LBNL divisions: AFRD (Accelerator and Fusion Research Division), ALS (Advanced Light Source), CSD (Chemical Sciences Division), Dir/Ops (Directorate/Operations), EETD (Environmental Energy Technologies Division), EH&S (Environment, Health, and Safety Division), ESD (Earth Sciences Division), LSD (Life Sciences Division), MSD (Materials Sciences Division), NSD (Nuclear Science Division), and PBD (Physical Biosciences Division).

Division Self-Assessments

Performance Rating

Each division's ES&H performance rating is based on a color-coded system of determining whether each performance criterion and expectation is fully met, partially met, or marginally met. Points are assigned for the three performance gradients, and a percent performance is calculated for each performance indicator and for overall division performance. A green rating, which means division performance is within the range of excellent to outstanding for an expectation, is worth three points. A division is assigned two points for a yellow rating, which means it is partially meeting performance requirements for the metric. A red rating, which is worth one point, communicates that a division's performance is marginal for a performance indicator. Finally, a gray rating denotes that a performance metric is not applicable to the division. Rating determinations for each performance metric are detailed in Appendix B of this report.

Performance Results

The Division Self-Assessment performance criteria and expectations are used to evaluate the effectiveness of each division's ISM program. ISM provides the foundation for the divisions' ES&H programs. Each division performs self-assessment activities throughout the performance year. At the end of the performance year, each division prepares a report that summarizes these activities and appraises their ES&H performance. OCA reviews these reports and validates the division performance in meetings with division and DOE representatives.

ISM Core Function 1: Define Work

Divisions effectively communicate ES&H issues with staff. Divisions employ several methodologies to ensure that this communication is a two-way exchange between management and staff. The most common form of communication is the division safety committee. Most divisions have active safety committees that include managers, but management also communicates safety policies with staff through other means as well. Several divisions held town-hall or all-hands meetings that included safety on the agendas. Most divisions also periodically include safety on the agendas of regular senior management meetings. This gives safety coordinators an opportunity to discuss safety issues with senior management and to address their concerns. Group meetings that include safety topics are also a popular method of engaging staff.

Some divisions took additional measures to ensure safety communications were effective. MSD extensively modified the course EHS0026 (EH&S for Managers, Supervisors, PIs, and Mentors of Students) to reflect division priorities and needs, and PIs presented the class to foster greater involvement. Physics conducted its vertical-slice

safety interviews, which include research assistants, students, guests, employees, and group leads. The results of the interviews educate Physics on the strengths and weaknesses of its safety program. Supervisors in AFRD complete and implement a supervisor safety plan that describes their commitment to safety. ALS formed a staff safety committee to address the findings of a Radiation Safety Committee report. This committee met 35 times over a six-month period. The Physical Biosciences Division provides staff with walkaround checklists that are updated quarterly, each with a different focus. The Facilities Division continued its use of safety message boards, the safety carnival, and the WOW program.

The Genomics Division improved its safety program, increasing senior and line management involvement at its Joint Genome Institute (JGI)/East location. However, the interactive approach and management involvement at JGI/East are applied to a much lesser extent at JGI/West.

All divisions performed environmental performance reviews for selected new and existing work. Some divisions included a review of environmental factors as part of the proposal process for new and renewed work, and others used their internal self-assessment checklists to solicit suggestions for reducing waste and conserving resources. In most cases, divisions focused on minimizing the generation of hazardous and radioactive waste. For example, ESD reduced mixed waste generation by introducing innovative benchtop neutralization techniques. The Laboratory purchased two filmless digital imagers for LSD, significantly reducing low-level radioactive waste generation and related disposal costs.

Divisions also pursued resource-conservation opportunities in reviewing their environmental performance. For example, Facilities installed a chemical-free water cooling system at B37. Besides reducing chemical waste, this system will substantially reduce water consumption. Several divisions focused on improving their recycling efforts. The Materials Sciences Division recycled large quantities of wood and cardboard from unpacking new equipment during the Molecular Foundry start-up. The Physical Biosciences Division implemented a major recycling initiative, and joined a vendor's pipette tip recycling program, which recycles plastic tip holders previously disposed of as regular trash. ALS revised its self-assessment checklist to include an item to check trash cans for obvious nonrecycling of recyclable materials. Computing Sciences continued it efforts at reducing energy consumption in office spaces by purchasing LCD-type displays for computer monitors.

ISM Core Function 2: Identify and Analyze Hazards

All divisions inspected 100% of their staff workspaces during the course of the self-assessment year. Prompted in part by a mandate from Director Chu, senior and line managers increased their participation in workspace inspections and walkthroughs. The EH&S Division developed a new course, EHS0027 (Performing an Effective Safety Walkaround), to assist Lab personnel in their responsibilities for routine walkarounds. EH&S presented a customized course to EETD and PBD. Senior division management attended the training sessions, thereby endorsing the practice and importance of

performing routine safety walkthroughs. Customized walkaround training sessions are planned for AFRD and Engineering.

In addition to informal walkthroughs, self-assessment teams perform inspections to ensure all workspaces are inspected. Some divisions continued to have their safety coordinator collaborate with principal investigators and group leaders to inspect their respective staff workspaces. The Engineering Division piloted a new approach that involves multiple supervisors in safety walkthroughs of its facilities. For example, in the B77 shops facility, four supervisors walked the entire complex together to observe and detect safety practices and conditions of each other's areas, in addition to their own. Engineering performed a similar walkthrough in its B50A space and plans to continue this practice.

Director Chu's mandate that divisions inspect all of their spaces also applies to Appendix I space on the UC Berkeley campus. This exercise highlighted continuing issues with ES&H requirements of the Partnership Agreement (formerly the Memorandum of Understanding) between LBNL and UC, signed in early calendar year 2004. Divisions remain uncertain of the applicability of DOE requirements, funding to implement those requirements, the definition of work on campus, and their responsibilities for ensuring corrective actions to address ES&H findings.

Most divisions document their hazards and environmental impacts inherent in their work in the institutional Hazard, Equipment, and Authorization Review (HEAR) database. A few divisions do not use the HEAR database but instead document hazards in workspace or project hazard review forms. Earth Sciences Division also uses another form, an Off-Site Safety and Environmental Protection Plan (OSSEPP) to account for hazards encountered during fieldwork. EETD identifies and controls hazards encountered in off-site work via completion and review of its Off-Site Safety Review form. Several divisions perform safety reviews prior to project approval. Examples include ESD's Safety Review Questionnaire and Physics' Project/Facility Safety Review Questionnaire.

Hazard identification in five divisions needs improvement. Facilities maintains current HEAR information on spaces it owns/occupies, but for activities performed around the Lab, hazard identification is inconsistent and appears to have gaps. In MSD, work in the Molecular Foundry is thoroughly reviewed by the Division ES&H Manager and the EH&S Division. However, review of other MSD laboratory operations and updates of the HEAR database require improvement. HEAR serves as the primary inventory of hazards in EH&S, though HEAR data for approximately 20% of division space was not updated during the performance year.

ISM Core Function 3: Control Hazards

Divisions ensure that engineering controls are in place and maintained. Most divisions check engineering controls during self-assessment inspections. Managers also check engineering controls during routine work and inspections. Materials Sciences took a proactive approach when the Division discovered four cases of broken fume-hood sash wires in B66. To determine the extent of this condition in B66, MSD inspected all the building's hood sash wires. Some engineering controls were not inspected according to schedule due to the EH&S Division's resource limitations. EETD reported several cases

in which hoods were behind in their biennial or annual inspection schedule and/or with labeling deficiencies, which were left unaddressed during the performance year.

Following a third-party inspection of machine guarding commissioned by Engineering, the Division began modification/retrofit work in August 2005, and completed the process in January 2006. Staff verifies guarding completeness, maintenance, and use during routine walkthroughs. Engineering extends machine guarding inspection and retrofit services to other divisions' shops as requested.

Divisions are controlling hazards administratively through formal authorizations and self-authorizations. Formal authorizations were reviewed as required. Self-authorized work was controlled through various means. Laboratory facilities, such as the Advanced Light Source, JGI, Hazardous Waste Handling Facility, and the 88-Inch Cyclotron, use operating procedures and protocols in their work. AFRD's Activity Hazard Document (AHD) checklists and line-management authorization (developed in FY06 and implemented in FY07) provide a systematic check by responsible line managers of the accuracy and completeness of AHDs. Other divisions use self-assessment and management inspections to review self-authorized work. Most divisions use the HEAR database to document the control of self-authorized work, although some divisions use project and space safety reviews to perform this function.

All divisions continue to focus on ergonomic hazards and improve aspects of their ergonomic safety program. Divisions address ergonomic hazards through training, ergonomic workstation evaluations, and implementing corrective actions resulting from the evaluations. Divisions also consider conditions of workspaces during informal walkthroughs and documented self-assessment inspections. Several divisions were extremely diligent in completing staff training and evaluations. Facilities, EETD, Nuclear Sciences, and Physics trained 100% of required staff in EHS0060. Over 1,100 evaluations were completed Laboratory-wide during the performance year as compared to 803 evaluations completed in 2005. The Directorate/Operations and Computing Sciences Directorate are particularly focused on ergonomics, since this is the most significant hazard to their staffs.

Some divisions must more diligently track and ensure training in ergonomic hazards, and improve the timeliness of ergonomic evaluations. Five divisions trained less than 90 percent of staff required to complete ergonomic training. Divisions promptly conducted workstation evaluations in response to employee pain, though some struggle to complete other evaluations in a timely manner. Some divisions have trained in-house evaluators in order to expedite workstation evaluations.

Several divisions address ergonomic hazards outside of computer workstations. The Chemical Sciences Division evaluated glovebox operations, and is pursuing computer docking stations in laboratories to mitigate injuries developed from using laptop computers in awkward situations. Science divisions continue to implement ergonomic improvements to routine laboratory work, such as using ergonomic pipettes.

In response to the Berkeley Site Office's (BSO's) concerns about inadequate engineering controls in some laser labs at the Laboratory, EH&S Laser Safety Experts conducted a comprehensive review of Class 3b and 4 laser operations against the Activity

Hazard Document for the particular operation(s). This involved a field review of approximately 60 laser work areas. The review included the following activities: the documentation of a laser safety audit of laser labs by using a standardized form; the confirmation and update of laser inventory data; the evaluation of a laser interlock function; the examination of laser eyewear; and the review of AHDs for compliance with laser safety requirements. The results of the reviews indicated that controls described in the AHDs were largely in place and appeared to be adequate. However, more emphasis is needed to be placed on improving work practices, such as the storage of laser eyewear, the development of written interlock procedures, the performance of routine testing, updating laser warning signage, improving beam containment, and labeling vertical laser beams.

Divisions effectively addressed chemical hazards by maintaining their chemical inventories and ensuring that peroxide chemicals were tested as required. Furthermore, divisions have control processes in place, to ensure that hazardous materials can continue to be accounted for during lab moves and for departing PIs.

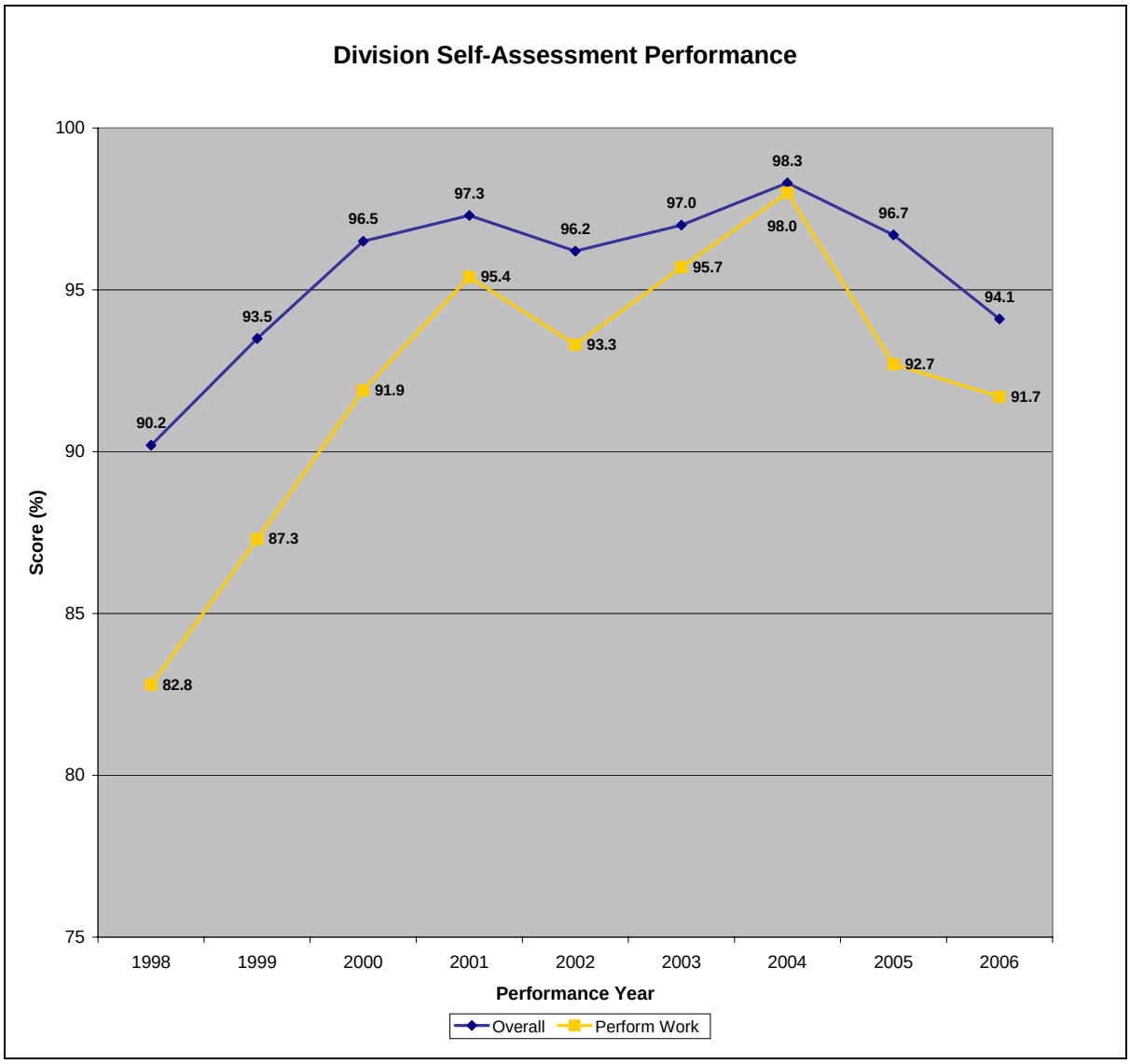
ISM Core Function 4: Perform Work

The Laboratory-wide results in the Perform Work metrics declined precipitously this year, as compared to the 2003, 2004, and 2005 performance years. This is primarily due to a decline in waste management and radiological work performance from previous years.

Satellite accumulation area (SAA) compliance declined again this year. In 2003 and 2004, all divisions met the 90% SAA compliance threshold required for a satisfactory (green) rating. In 2005, three divisions did not meet the 90% compliance threshold, and the SAA compliance metric score decreased from 100% in 2003 and 2004 to 90.5% in 2005. In 2006, six divisions performed at the partial (yellow) level, and two at the marginal (red) level, resulting in a Laboratory-wide aggregate score of 78.6%. The 2006 SAA compliance rate was 81%. AFRD improved its performance, going from 75% in 2005 to 100% in 2006. Conversely, EH&S and EETD performed at the marginal (<75% compliance) level for the second consecutive year, while Genomics and MSD both had an SAA compliance rate of less than 70%.

Quality Assurance waste sampling compliance also declined in 2006. AFRD and EETD received partial (yellow) ratings, and ALS scored at the marginal (red) level, resulting in a Laboratory-wide aggregate score of 88.1%.

The Waste Management Group of the EH&S Division issued two Nonconformance and Corrective Action Reports (NCAR) to two divisions this year. This is an improvement from 2005 when six NCARs were issued to five divisions. As a result, the Laboratory-wide NCAR score was an aggregate 95.2%; in 2005, the score was 76.2%.



An increase in work performed under the RWP program and changes to the noncompliance tracking system resulted in more noncompliance reports in the RWA, RWP, and XA programs as compared to recent years. The Laboratory issued 14 Level-2 (major) and two Level-3 (safety significant) RWA, RWP, or XA violations in 2006, up from seven Level-2 RWA violations in 2005. (Note: EH&S revised the classification of noncompliances in 2006. The seven Level-2 violations reported in 2005 correspond to 10 under the revised system.) EH&S cited noncompliances in laboratory operations, remodeling activities in high-hazard areas, and relocations of lab operations using radioactive material. One violation was for noncompliance with an XA. This was the first year noncompliances with XAs were included in the performance data. To address the root cause of a number of this year's incidents, EH&S is focusing on improving the General Employee Radiation Protection Training (GERT) program and formalizing training for Facilities staff and others working under RWPs.

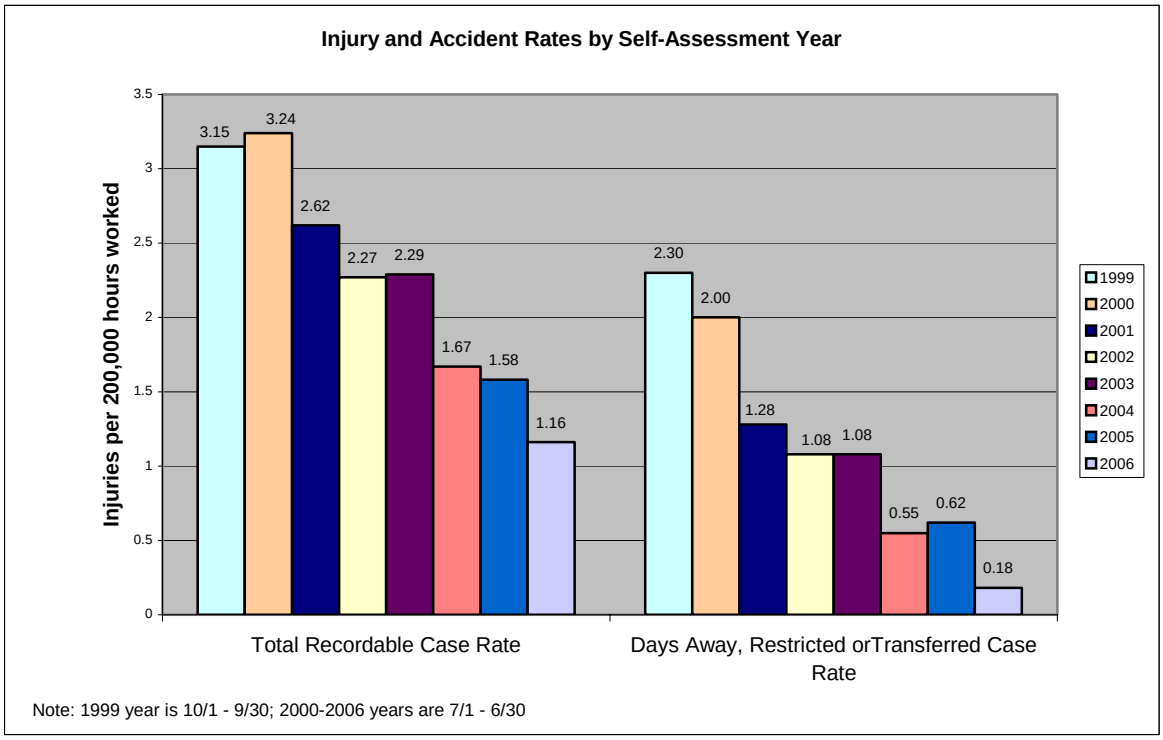
The decrease in the Laboratory-wide Hazard Identification and Analysis score to 89.6%, the Perform Work score to 91.7%, and the workspace safety LCATS/CATS on-time completion rate score to 85.4% lowered the overall 2006 Self-Assessment score to 94.1%, the lowest since 1999.

Berkeley Lab had four environmental violations and unplanned releases during 2006. The City of Berkeley issued a minor violation to the Chemical Sciences Division for an increase in argon gas storage not reflected in the chemical inventory. Following a June 2005 inspection of the Hazardous Waste Handling Facility, the California Department of Toxic Substances Control issued its final report, citing two Class II violations of the Part B Permit training program. Lastly, while cleaning out a storm drain catch basin, Laboratory employees discovered approximately 2.9 pounds of mercury in the sediment, an amount exceeding the one-pound federal reportable quantity. The mercury was believed to be legacy material in the catch basin sediment for at least 10 years.

While the Job Hazard Questionnaire (JHQ) percent completion score remained high at 97.9%, the percent completion score of required courses decreased from 97.9% in 2005 to 91.7% in 2006, with two divisions performing in the partial (yellow) range, and one in the marginal (red) range.

All divisions hosting students address their safety in a proactive manner. Directorate/Operations, which implemented a Safety Responsibilities memorandum of understanding (MOU) for all Center for Science and Engineering Education (CSEE) students participating in the program, tracks completion of the Safety MOU, JHQ completion, and any Work Plan that is applicable to the students' activities. The Life Sciences Division conducts training sessions more frequently in summer months in order to facilitate training students.

Injury and accident rates were not evaluated at the divisional level during the 2006 performance year. The 2006 self-assessment Laboratory-wide total recordable case (TRC) rate is 1.16, continuing a downward trend established since 2000. The 2006 self-assessment TRC rate is the lowest on record, surpassing the 2005 self-assessment rate of 1.58. Accelerator and Fusion Research, Nuclear Sciences, and Life Sciences divisions had no recordable staff injuries this year. For AFRD, this is the sixth straight year with no recordable injuries and accidents. The Laboratory's days away, restricted, or transferred (DART) case rate also reached a record low of 0.18.



ISM Core Function 5: Feedback and Improvement

Managers and staff in all divisions are involved in ES&H feedback and improvement opportunities. Managers participate in division safety committees, workspace inspections, and accident review boards. Senior managers are very involved in ES&H activities, and middle management took a more active role in all divisions.

Most divisions are effectively tracking and resolving safety deficiencies. Divisions entered 2,531 LCATS/CATS findings in 2006 as compared to 1,824 in 2005 (excluding Best Practices entries). However, the Laboratory-wide completion rate score dropped from 91.7% in 2005 to 85.4% in 2006. The majority of divisions resolved issues within the prescribed time frame with a greater than 90% completion rate, while AFRD, Computing Sciences, and EH&S performed in the 80% to 90% range, and ALS and Facilities at the less than 80% range.

Most divisions effectively addressed opportunities for improvement identified from the 2005 self-assessment period. Those divisions resolved programmatic findings from MESH reviews, integrated functional appraisals, and division self-assessments. Genomics made significant improvements to its safety organization, though limited to JGI/East. Three other divisions did not effectively address all opportunities for improvement from the 2005 self-assessment. Actions taken by EH&S and EETD did not result in an improved SAA compliance rate, and MSD's ergonomics training completion rate remained less than satisfactory.

All divisions are diligent in reviewing the injury and accident reports. Root causes are effectively identified, and corrective actions are implemented. Divisions' management participates in accident reviews, through either accident review board meetings or direct discussion with the injured staff and responsible supervisors. EH&S updated the accident review policy, standardized the process, and developed incident-review training required for EH&S division liaisons and division safety coordinators.

Integrated Functional Appraisals (IFAs)

IFAs evaluate higher-hazard and complex operations that demand subject matter expertise from the EH&S Division. The focus of the IFA is authorization compliance. The following divisions received an IFA during the 2006 fiscal year:

Division	IFA Date
Chemical Sciences	June–August 2006
Environment, Health, and Safety	May–July 2006
Genomics	June–August 2006
Life Sciences	July–August 2006
Materials Sciences	July–November 2006
Physics	June–July 2006

IFA Results

IFAs performed in 2006 concluded that divisions maintain a high level of authorization compliance, and that workspaces are generally well maintained. Noncompliances, which were noted in each division, were either minor or few, given the total number of authorizations reviewed. Noteworthy practices and opportunities for improvement for each of the five assessed divisions are listed in Appendix C.

Significant noteworthy practices from the IFAs include the following:

1. All assessed divisions maintain some form of radiological work authorization (RWA). With few exceptions, housekeeping in areas where radioactive material is stored or used was very good, and all authorizations were in compliance at the time of review.

2. Several researchers in Physics and Life Sciences divisions maintain excellent on-the-job training guidelines and documentation, assuring consistency in training and an understanding of processes by trainees.

3. An RWA holder in EH&S developed a User Survey Standard Operating Procedure (SOP) detailing the steps required for routine user surveys of work and storage areas in the laboratory. This procedure provides the radiation workers with details about instrument use, forms, and common areas where surveys are required. Lab-wide use of a detailed User Survey SOP would result in documented surveys indicative of a well-controlled and managed work area and program.

4. JGI staff dedicated a laser service area (e.g., light curtains) to service the MegaBACE units. Use of laser curtains block potential laser radiation from other areas and preclude other occupants from having to participate in laser controls.

5. There is a strong commitment at the upper levels of the Materials Sciences Division administration to providing resources for managing environment, safety, and health matters within MSD. Over the last 18 months, the Division has hired a professional credentialed EH&S and Facilities Manager, a part-time EH&S Administrator, and a full-time EH&S Technician.

Opportunities for improvement identified from the IFAs include the following:

1. All of the scientific divisions reviewed were out of compliance with AHD requirements. Deficiencies included expired training, use of materials not listed on the AHD, the servicing of a laser system by an unlisted vendor, and not following controls listed in the AHD. Migration to the new electronic AHD system will enable divisions to track AHD requirements and compliance more effectively.

2. Both divisions performing work under Biological Use Authorizations (BUAs) lacked laundry services for lab coats as required by the BUAs.

3. Four of the six divisions assessed had SAA compliance issues. IFA team subject matter experts discussed deficiencies with SAA operators, and the divisions took appropriate corrective action.

Safety Review Committee (SRC) Management of ES&H (MESH) Reviews

The SRC conducts reviews of each division's management of environment, safety, and health in operations and/or research, focusing on the implementation and effectiveness of each division's ISM Plan. For fiscal year 2006 (FY06), the SRC conducted MESH reviews in the following divisions:

Division	MESH Review Date
Advanced Light Source	July 2006
Chemical Sciences	November 2006
Facilities	August 2006
Materials Sciences	September 2006
Physics	December 2006 (in progress)

The MESH reviews determined that all divisions' senior management have a strong commitment to safety. All divisions have robust methods of safety communication, and since their last MESH, several divisions augmented their systems and/or staff to improve support for line managers in their responsibilities for safety.

The following common noteworthy practices were found during FY06 MESH reviews:

1. Strong safety commitment by senior management is evident for all divisions. The Advanced Light Source made tremendous efforts to address recommendations from a Radiation Safety Committee (RSC) subcommittee investigation of shielding control procedure violations. The division redefined roles and responsibilities for line-management accountability for safety, and elevated qualifications for its ES&H manager position. The Chemical Sciences Division's new Deputy Division Director and Safety Coordinator, as well as other senior division personnel, made changes in CSD's management of ES&H, resulting in an improved partnership between CSD and the EH&S Division. The Facilities Division continued to support the Workers Observing Workers (WOW) program and special safety activities. The Materials Sciences Division (MSD) took significant steps to increase staffing of its safety program, hiring a new division safety coordinator, safety technician, and building manager. The division safety coordinator is a full-time, career safety professional, replacing an MSD researcher who performed the duties on a part-time basis.

2. The divisions recognize the importance of engaging all staff in order to create and maintain a safe workplace. The ALS Division's safety Web site and QUEST process are effective and proactive. The ALS interim ES&H manager initiated coordination

meetings with the Beamline Scientist line managers in order to assist them with their new added safety responsibilities. In order to ensure timely communication of safety issues, CSD requires and maintains an email list for all staff, including those on campus. The Facilities Division's well-developed system of ES&H communications includes safety awards, special activities (e.g., the Safety Carnival and Material Handling Safety Fair), the WOW program, and personalized safety orientation training by the Division Safety Coordinator for new employees and some contractors. MSD tailored safety training for supervisors (EHS0026) specific to its hazards, and enlisted division personnel to teach the course, making it more meaningful to some PIs.

All four divisions struggled with authorization compliance. The specifics below are derived from the divisions' self-assessment, MESH reviews, or other reports:

Advanced Light Source – Following several shielding control procedure violations at the ALS, the Laboratory submitted a Noncompliance Tracking System report in accordance with the Price-Anderson Amendments Act, and the Radiation Safety Committee (RSC) commissioned a subcommittee investigation to assess the effectiveness of shielding control procedures, engineering controls, training, EH&S Division staff support, and management oversight. ALS's SAA compliance rate was 75% for self-assessment year 2006.

Chemical Sciences – The CSD MESH team identified a lack of understanding by staff of the requirement for a current AHD and completion of new laser safety training. The limitations imposed by another AHD were unfamiliar to a CSD researcher who attempted to order a significantly larger quantity of a hazardous gas than allowed by the AHD. A comprehensive review of Class 3b and 4 laser operations conducted by EH&S Laser Safety Experts identified multiple noncompliances against laser AHD requirements.

Facilities – The Division received eight (seven Level 2 and one Level 3) Radiological Work Permit (RWP) violations. Most of the violations involved performing work not authorized by the RWP or work performed by unauthorized personnel, and failure to conduct pre-job briefings and job-specific training to new radiation workers.

Materials Sciences – A comprehensive review of Class 3b and 4 laser operations conducted by EH&S Laser Safety Experts identified multiple noncompliances against laser AHD requirements. Maintenance and implementation problems extended to non-laser AHDs, as identified by the Division and during the IFA and MESH reviews. MSD's SAA compliance rate was 68% for self-assessment year 2006.

Institutional: The Chemical Science's MESH identified perceived inconsistencies—a concern mentioned by staff at all levels—in ES&H oversight of work performed on the main LBNL site and in Appendix I space on the UC Berkeley campus. Most staff members believe that LBNL safety requirements do improve safety, but individuals question the benefits versus costs.

Institutional: The MSD MESH identified issues with the Facilities Division's equipment installation estimates. Initial estimates appear negotiable, and the cost of making proper safety modifications high.

Noteworthy practices and opportunities for improvement identified in each assessment are provided in Appendix C.

ES&H Improvements

Status of Fiscal-Year 2005 (FY05) Self-Assessment Corrective Actions

Each year, as a result of the annual ES&H self-assessment process, the Laboratory identifies institutional issues that require management action. The statuses of the corrective actions for the institutional issues identified in the FY05 ES&H Self-Assessment Report are described below.

1. Hazard, Equipment, and Authorization (HEAR) Database

The HEAR database is still not consistently used, as several divisions prefer other forms of hazard inventory. Therefore, the institutional hazard inventory remains deficient. During FY06, the EH&S Division made several technological improvements in HEAR. However, the most significant barrier to divisions using HEAR is the user interface. Upgrades to the user interface have been developed, but not deployed in the database. Until these upgrades are deployed, divisions will continue to resist using HEAR. EH&S should continue the progress made during FY06 and expeditiously deploy the user interface enhancements. EH&S will then need to work closely with the divisions to ensure that the upgrades address current barriers to database usage.

2. Communication of the UC/LBNL Partnership Agreement (formerly the Memorandum of Understanding)

The Laboratory made efforts to address the communication gap by engaging Laboratory management, division safety coordinators, and EH&S functional managers in matters of the Partnership Agreement. The Laboratory and UCB directors of EH&S also met periodically to discuss issues related to the agreement. Furthermore, the recently formed UC/LBNL Joint Research Issues Task Force includes an EH&S subcommittee that will address Partnership Agreement implementation issues. The LBNL EH&S Division also posted the Partnership Agreement on its Web site. However, scientific divisions remain uncertain of the applicability of DOE requirements, funding to implement those requirements, the definition of work on campus, and their responsibilities for ensuring corrective actions to address ES&H findings.

3. EH&S Database Support of Ergonomic Evaluations

The Ergonomics Database and EH&S Training Database are linked so that individuals automatically receive credit in the EH&S Training Database for ergonomic evaluation training (EHS0068) when an ergonomic evaluation is recorded in the Ergonomics Database. This ensures consistency of records between the two databases. In addition, EH&S is refining the Ergonomics Database to enhance status tracking of evaluations and recommended improvements.

4. Satellite Accumulation Area (SAA) Compliance

Satellite Accumulation Area Compliance was not adequately addressed during FY06. EH&S should reemphasize line management accountability for SAA compliance and pursue systematic improvements.

FY06 Recommendations for Institutional Improvements

Based on the results of the FY06 Division Self-Assessments, IFAs, and the SRC MESH reviews, the following opportunities for institutional improvements are recommended:

1. Communication of the UC/LBNL Partnership Agreement

Divisions remain uncertain of the applicability of DOE requirements, funding to implement those requirements, the definition of work on campus, and their responsibilities for ensuring corrective actions to address identified safety deficiencies. These issues were highlighted during inspections of Appendix I space on the UC Berkeley campus, and during a follow-up meeting between LBNL and UC Berkeley EH&S representatives.

The Chemical Science Division's MESH identified perceived inconsistencies—a concern mentioned by staff at all levels—in ES&H oversight of work performed on the main LBNL site and in Appendix I space. Most staff members believe that LBNL safety requirements do improve safety, but individuals question the benefits versus the costs. Consistency in ES&H oversight should be addressed in a review of the Partnership Agreement.

The Laboratory should continue its efforts to communicate requirements of the existing Partnership Agreement, concurrent with updating the agreement to address issues raised during recent external and internal assessments.

2. Hazard Identification and Inventory

Hazard identification and inventory requires improvement. The Lab lacks a systematic methodology for identifying hazards and inventorying these hazards. Although the Lab is inspecting all workspaces, some routine work activities (such as Facilities work) are not reviewed, and not all inspection results are effectively documented. The Lab needs to ensure that (1) all workspaces and work activities are reviewed for inherent hazards and that (2) these hazards are compiled in a comprehensive and current inventory. Proposed institutional requirements for workspace inspections and an improved HEAR database will help address this issue.

3. Satellite Accumulation Area (SAA) Compliance

Compliance with SAA requirements declined considerably over the last two performance years. In 2005, the Laboratory-wide compliance rate dropped five percent (from almost 96% to 91%), and five of the NCARS issued in 2005 were for waste stored in an SAA for greater than one year. In 2006, the Laboratory-wide aggregate SAA

compliance rate was 81%. Quality Assurance waste sampling percent compliance score also declined in 2006 to 88.1%.

Noncompliant waste storage at generator locations is a significant regulatory liability for the Laboratory, and was noted in both the divisional self-assessments and the IFAs for 2006.

4. Authorization Compliance

a. Radiological Work

An increase in work performed under the RWP program and changes to the noncompliance tracking system resulted in more noncompliance reports in the RWA, RWP, and XA programs, as compared to recent years. The Laboratory issued 14 Level-2 (major) and two Level-3 (safety significant) RWA, RWP, or XA violations in 2006, up from seven Level-2 RWA violations in 2005. (Note: EH&S revised the classification of noncompliances in 2006. The seven Level-2 violations reported in 2005 correspond to 10 under the revised system.) EH&S should continue its efforts to improve the GERT program and to formalize training for Facilities staff and others working under RWPs.

b. Activity Hazard Documents

The IFAs identified cases of misunderstanding by staff of AHD requirements, including the status of authorizations, limitations, and required training. Furthermore, a comprehensive review of Class 3b and 4 laser operations conducted by EH&S Laser Safety Experts identified multiple noncompliances against laser AHD requirements. The new electronic AHD system should facilitate improved compliance with the administrative elements of authorizations. The revised AHD user signoff section includes a more explicit statement of understanding, which may heighten awareness of requirements for authorized users. LBNL should implement technical assurance systems for line and ES&H programs, and routinely monitor authorization compliance.

5. Cost of Facilities Division Work

The Facilities Division's equipment installation estimates appear negotiable, and the cost of making proper safety modifications is high. Initial estimates are often inflated, which slow the implementation of safety modifications and discourage divisions from pursuing these modifications. The Facilities Division's cost-and-labor estimating process should be reviewed, or a mechanism to bring in outside vendors should be pursued.

6. Timely Corrective Action Implementation

Although divisions are extremely diligent in tracking ES&H deficiencies and corrective actions, several struggled to resolve these deficiencies on schedule. The Lab-wide on-schedule completion rate for FY06 was 85%, down from previous years. In addition, a few divisions did not adequately address all of the opportunities for improvement identified in FY05.

Appendix A
PY06 Division Self-Assessment Performance Criteria

Three major initiatives in PY06:

- More emphasis on safety communication between managers and employees. Things to emphasize include safety topics at regular group meetings, effective Division Safety Committees (or equivalent), and good definitions of roles and responsibilities for safety in Division ISM plans.
- More emphasis on management/employee interaction on ergonomic injury prevention.
- More emphasis on safety inspections (or more simply managers walking and talking with their employees, and discussing how work is performed safely and how safety can be improved) and a greater focus on observing safe work behaviors during inspections, as well as observing safe conditions. Also increased emphasis on the communication between managers and employees on the inspection itself and on the corrective action.

Items that are new for PY06 (bold italic) are not required until 1/1/06.

EXPECTATION	VALIDATION	RATING
DEFINE WORK		
E1. Line management regularly communicates ES&H policy, procedures, management safety expectations, and lessons learned to all staff. Division staff has clear lines of communication to convey ES&H issues, concerns, and suggested improvements to Lab and Division management. Examples of appropriate communications include: • Annual all-hands division meeting • Active and effective Division Safety Committee or equivalent • Safety recognition • Group safety meetings • Division ES&H Web page or links to ES&H resources • Roles and responsibilities detailed in ISM plan Division-wide emails • Managers will set aside a portion of group meetings on a	V1. 1) Are specific safety topics discussed at ongoing group meetings or monthly safety meetings (i.e., is time set aside to discuss safety at meetings)? Is the process systematic? Is information disseminated to staff? 2) Is an established Division Safety Committee (or equivalent) active in addressing employee safety issues and communicating safety information (how to avoid injuries) both to management and employees? 3) The Division ISM Plan has correct	3 out of 3 satisfied – green 2 out of 3 satisfied – yellow < 2out of 3 satisfied – red

EXPECTATION	VALIDATION	RATING
DEFINE WORK (continued)		
frequency specified in the Division ISM Plan and discuss safety issues relevant to the group. Alternatively, managers may conduct safety meetings (a specific meeting where the entire agenda is dedicated to safety for that workgroup). • Management conveys safety expectations and "actively listens" to employee safety ideas and concerns in regular personal contacts.	and adequate definitions of EH&S roles and responsibilities within the Division. Personnel are familiar with their assigned roles and responsiblities and are performing them adequately.	
E2. Work planning for new and existing work includes environmental reviews. Review includes waste reduction, emission reduction, and/or resource conservation.	V2. 1) The Division demonstrates progress in waste minization opportunities identified in PY05 self-assessment. 2) Divisions conduct documented environmental performance reviews for new experimental work. Waste reduction and resource conservation strategies are implemented, as applicable. Divisions include waste minimization and resource conservation in division project review protocols. 3) Divisions with no new work conduct an environmental performance review for at least one existing research or operations process, and implement appropriate measure(s).	Complete #1 and #2, OR #3 – green Complete #1 OR #2/3 – yellow No progress – red
IDENTIFY HAZARDS		
E3. Workspaces are inspected/observed and evaluated on a regular basis. All workspaces should be inspected. Managers need only inspect a portion of the areas/employee-work-activities they are responsible for during each inspection (peer reviews between managers is encouraged), but all workspaces must be inspected every year. These inspections must be documented. Managers are encouraged to involve employees in these inspections.	V3. % Division workspace inspected. Managers should document workspace inspections and deficiencies discovered. Deficiencies should be tracked in CATS (as appropriate).	Satisfactory – green Partial – yellow Marginal – red

EXPECTATION	VALIDATION	RATING
IDENTIFY HAZARDS (continued)		
E4. Divisions review work activities to identify, analyze, and categorize hazards and environmental impacts for the associated work. Examples of hazard inventory include: • HEAR database (or equivalent) • Project safety review • Workspace safety review • Job Hazard or Safety Analyses (JHA/JSA)	V4. For all Division projects, programs, and operations, have hazards been identified and inventoried? Does inventory include non-routine, new work, and modification of existing work? Is there documentation to show that appropriate levels of management are actively participating in the review of hazards?	Satisfactory – green Partial – yellow Marginal – red
CONTROL HAZARDS		
E5. Divisions ensure engineering and other safety/environmental controls are in place and maintained. Examples of engineering controls include, but are not limited to: • Guards • Fume hoods • Interlocks • Exhaust system filtration • Secondary spill containment • Personal protective equipment • In-lab and stack emission monitors • Cranes and hoists • Lockout/tagout • Eyewashes and safety showers • Ergonomic workstation modifications (furniture, equipment, and/or accessories) • Manual material handling lift assist devices	V5. Are engineering controls monitored as part of division self-assessment programs? Are line managers held accountable for assuring that controls are certified/checked, calibrated, and/or serviced prior to use within the required schedule?	Satisfactory – green Partial – yellow Marginal – red
E6. Divisions ensure administrative controls are in place and maintained. Examples of administrative controls for self-authorized work include	V6. Are hazards controlled for all Division projects/activities? Are administrative controls reviewed annually and when work is modified? This includes work	Satisfactory – green Partial – yellow Marginal – red

EXPECTATION	VALIDATION	RATING
CONTROL HAZARDS (continued)		
• Work procedures • Project safety reviews • Assurance letters • Job rotation/sharing	under formal authorizations (e.g., AHDs, RWAs) and self-authorized work (i.e., Division approval only). Are line managers held accountable for terminating or suspending operations when approvals are lacking, authorizations have expired, or training is not current?	
E7. Divisions ensure that ergonomic hazards (computer, laboratory, and material handling) are adequately controlled and that employees are knowledgeable and engaged in this process, including the early reporting of ergonomic pain or discomfort (before an injury). Ergonomic issues/concerns/discomfort/pain are reported promptly for immediate corrective action.	V7. The Division has an effective ergonomic safety program as evidenced by: • Employees report ergonomic pain or discomfort early, and management takes immediate action to address these reports. • 100% of required staff complete EHS0052. • 100% of required staff complete EHS0060. • Ergonomic evaluations are conducted within 30 days of the request (no pain reported). • Ergonomic evaluations are completed within 2 working days (when the employee returns to work) for any reported pain. (EH&S will perform all evaluations with pain reported in the request.) • Corrective actions completed within 30 days except for some ergonomic workstation reconfiguration and ergonomic furniture delivery (EH&S will support expediting these). • Divisions focus safety communications on ergonomic awareness and ergonomic injury prevention.	Satisfactory – green Partial – yellow Marginal – red

EXPECTATION	VALIDATION	RATING
CONTROL HAZARDS (continued)		
E8. Divisions maintain an accurate chemical inventory.	V8. % of chemical owners OR % of locations are updated in the Chemical Management System during the performance year (each division specifies an inventory process).	90 – 100% – green 80 – 90% – yellow < 80% – red
E9. Division-specific OSHA instances from the 2004 OSHA inspection are corrected in a timely manner.	V9. % completion rate by January 1, 2005, of OSHA instances from the 2004 OSHA inspection.	100% – green <100% – red
E10. Division laser safety program is effective in controlling exposure to laser hazards.	V10. The laser safety program is effective as evidenced by the following: • Laser AHDs are current. • Laser users on campus meet all campus laser trainings and have a campus authorization requirement. • All laser systems have been inspected annually and when significant modifications have occurred. • Laser inventory database has been updated for all division lasers.	Satisfactory – green Partial – yellow Marginal – red
E11. Divisions control chemical, radiological, and bio hazards during lab moves, and when PIs depart (i.e., when there is a change of accountability).	V11. Divisions have in place a control process to ensure the continuity of accountability of hazardous materials during lab moves and for departing PIs.	Satisfactory – green Partial – yellow Marginal – red
E12. Divisions ensure that peroxide-forming chemicals are effectively controlled.	V12. Does the Division have a program to control peroxide-forming chemicals?	Satisfactory – green Partial – yellow Marginal – red

EXPECTATION	VALIDATION	RATING
PERFORM WORK		
E13. Work is performed within the ES&H conditions and requirements specified by Lab policies and procedures.	V13. Work within authorization: % SAA compliance (including MWSAAs, RWCAs).	*Regulatory-driven* >90% – green >75% – < 90% – yellow <75% – red
	% authorization compliance (e.g., RWAs, RWPs, AHDs).	*Regulatory-driven* >90% – green >75% – < 90% – yellow <75% – red
	# of environmental violations from external agencies and unplanned environmental releases above reportable quantities.	*Regulatory-driven* 0 – green 1 – yellow 2 or more – red
	% compliance of QA waste samples.	*Regulatory-driven* >95% or only 1 failure – green >92% – < 95% – yellow <92% – red
	# Waste Management NCARs issued.	*Regulatory-driven* 0 – green 1 or more – red
E14. Staff is properly trained.	V14a. % completion of JHQs or equivalent system.	>90% – green >85 – < 90% – yellow <85% – red
	V14b. Based on JHQs or training profiles, % completion rate for required courses.	>90% – green >85 – < 90% – yellow <85% – red

EXPECTATION	VALIDATION	RATING
	PERFORM WORK (continued)	
E15. Division ensures that student safety issues are effectively addressed.	V15. Does the division have an effective safety program for students? This includes assuring students have completed their JHQs and required training, and their work conditions and work performance are safe.	Satisfactory – green Partial – yellow Marginal – red
	FEEDBACK AND IMPROVEMENT	
E16. ES&H deficiencies identified from workspace inspections, self-assessment activities, SAARs, Occurrence Reports, environmental inspections, and external appraisals are corrected in a timely manner.	V16. % completion rate of LCATS corrective actions (Levels 1, 2, and 3) implemented as scheduled. This includes corrective actions from SAARS and ORPS.	>90% – green >80% – < 90% – yellow <80% – red
E17. ES&H programmatic deficiencies identified from Management of ES&H (MESH) Reviews, Integrated Functional Appraisals (IFAs), and previous Division Self-Assessments are corrected in a timely manner.	V17. Opportunities for improvement identified during the previous self-assessment cycle (Div. Self-Assessment, IFA, and MESH) are implemented in a timely manner.	>100% – green >90–100% – yellow <90% – red
E18. Division employees report injuries and near miss events and the Division performs a thorough review of all staff injuries, accidents, and near-miss events, including analysis of conditions that led to injury. Corrective actions to prevent recurrence are identified and effectively implemented.	V18. Has the Division ensured that accident causes and corrective actions for first aid and recordable injuries are effectively identified on SAARs? Are corrective actions implemented to prevent recurrence? Is management actively promoting the early reporting for all injuries and near-miss events?	Satisfactory – green Partial – yellow Marginal – red

Appendix B
FY06 Division Self-Assessment Performance Ratings

Criteria	AFRD	ALS	Chemical Sciences	Computing Sciences	Directorate	EH&S	Engr	Environ. Energy Tech	ESD	Facilities	Genomics	LSD	MSD	Nuclear Sciences	Phys Biosci.	Physics	Expectation Score
Evidence of strong ES&H communication	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	Yes	Yes	97.9%
Work planning includes environmental performance reviews	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100%
% Workspace inspected	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Hazards and environmental impacts identified, analyzed, and categorized	Yes	Yes	Yes	Partial	Yes	Partial	Partial	Yes	Yes	Partial	Yes	Yes	Partial	Yes	Yes	Yes	89.6%
Engineering controls in place and maintained	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100%
Formal authorized work reviewed annually and when work is modified	Yes	Yes	Yes	N/A	N/A	Partial	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	95.2%
Chemical inventory maintained	100%	91%	95%	N/A	N/A	100%	83%	100%	90%	100%	100%	100%	87%	100%	95%	100%	95.2%
Effective laser safety program	Yes	Yes	Yes	N/A	N/A	N/A	Yes	Yes	Yes	N/A	Yes	Yes	Partial	Yes	Yes	N/A	97%
Control process for chemicals, radiological materials, and biohazards during moves or departures	Yes	Yes	Yes	N/A	N/A	N/A	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes	100%
Peroxide forming chemicals are controlled	Yes	N/A	Yes	N/A	N/A	N/A	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	N/A	100%
% SAAs in compliance	100%	75%	100%	N/A	N/A	79%	91%	75%	79%	100%	65%	77%	68%	100%	80%	100%	78.6%
% authorization compliance (RWA, RWP, AHD, etc.)	Yes	Partial	Yes	N/A	N/A	Yes	Yes	Yes	Yes		Partial	Partial	Yes	Yes	Yes	Yes	88.1%
# environmental violations and unplanned releases	0	0	1	N/A	N/A	3	0	0	0	0	0	0	0	0	0	0	92.9%
% QA compliance rate	90%	92%	97%	N/A	N/A	100%	96%	89%	99%	100%	97%	99%	98%	100%	96%	100%	88.1%
# NCARs	0	0	0	N/A	N/A	0	0	0	0	1	0	0	0	0	0	0	95.2%
% Job hazard questionnaire (JHQ) completed	95%	100%	100%	92%	91%	91%	100%	96%	91%	91%	95%	92%	86%	97%	92%	96%	97.0%
% Completion rate of required courses	92%	94%	95%	92%	89%	92%	91%	93%	87%	94%	93%	92%	90%	100%	93%	83%	91.7%
Student safety issues effectively addressed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes	100%
Workspace safety LCATS/CATS on-time completion rate	87%	76%	100%	88%	99%	85%	95%	94%	99%	55%	90%	99%	90%	94%	100%	100%	85.4%
Programmatic deficiencies resolved	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Partial	Yes	Yes	Partial	Yes	Partial	Yes	Yes	Yes	91.7%
SAARs properly completed and corrective actions implemented	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100%
Division Score	95.2%	91.7%	98.4%	93.9%	97.0%	88.9%	96.8%	95.2%	92.1%	82.4%	93.7%	96.8%	90.5%	96.8%	96.8%	96.5%	94.1%

Appendix C
FY06 Self-Assessment
Noteworthy Practices and Opportunities for Improvement

Division	Review	Noteworthy Practices	Opportunities for Improvement
Accelerator and Fusion Research	Division SA	• AFRD's supervisor safety program is a best practice that should be shared across the institution. • The AHD checklists are a best practice. The line management authorization, implemented in FY07, is also a best practice. • AFRD identified and tracked 232 safety deficiencies. This is indicative of an active safety program and a noteworthy practice.	• The Division should focus on increasing its completion rate for EHS0060. In FY06, the completion rate was 88%. • The Division should post shop-use policies at all machine shops. AFRD has a number of small machine shops; this is a vulnerability for AFRD staff safety. • The Division's QA compliance rate for sampled waste was 90%. • CATS on-time completion rate was 87%.
Advanced Light Source	Division SA	• All employees belong to safety circles that meet monthly. In FY06 the division formed a staff safety committee to address the findings of an RSC report. This committee met 35 times over a six-month period. • The self-assessment checklist includes an item to check trash cans for obvious non-recycling of recyclable materials.	• Self-authorization of work outside the ALS is too informal. The Experimental Safety Summary is an effective form of self-authorization, but this only extends to work at the ALS facility. Other work receives self-authorization through the QUEST team hazard review process. • Chemicals brought to the ALS are all controlled in the User Services Lab. This space is inspected twice daily. The Division should include chemical ownership/responsibility in the ISM plan. • Authorization compliance is a challenge for the Division. SAA compliance was 75%, and ALS received two Level-2 and one Level-3 RWA noncompliance citations. • The Division's QA compliance rate for waste sampled was 92%. • Mitigating measures are in place for the opportunities for improvement identified in FY05. The ALS should

Division	Review	Noteworthy Practices	Opportunities for Improvement
Advanced Light Source (continued)			ensure that these are fully resolved during the FY07 self-assessment cycle. One possible opportunity for improvement is adding a review of duck-and-cover space to the QUEST checklists. • CATS on-time completion rate was 76%.
	MESH	• ALS's safety Web site and QUEST process are effective and proactive. The ALS interim ES&H manager has initiated coordination meetings with the Beamline Scientist line managers in order to assist them with their newly added safety responsibilities. • The ALS reorganization is a positive start toward implementing a line-management–based structure. Moving beamline coordinators into Operations should help balance and clarify accelerator-versus-beamline roles, and assigning Beamline Scientists as the focus for user safety is likely to be a successful mechanism for assuring comprehensive user safety while at the facility. • Confidence in "stop work" authority was commonly expressed among those interviewed. • The proactive approach taken for top-off mode is commendable. The ALS has confronted the potential radiation safety issues head-on by engaging the Berkeley Site Office and other interested parties at an early stage. Based on simulations and testing to date, it appears likely that the radiation dose rate on the ALS floor will be lower with the two-fold higher average intensity in top-off mode. • The establishment of the Staff Safety Committee (SSC) representing a broad spectrum of the ALS community, and its charge to investigate future adverse incidents is noteworthy.	• It was unclear to the MESH Team how ALS will adequately support Beamline Scientists in their increased safety responsibilities, particularly those responsible for non-ALS beamlines. Line management responsibilities regarding supervision of Beamline Scientists need to be better established, especially for non-ALS supervised beamlines. • ALS ES&H vs. EH&S Division roles are not clearly defined. The RSC subcommittee clearly suggested that ALS ES&H should focus on support for fabrication and operations for user systems, while the EH&S Division should focus on oversight and compliance. To date, ALS management has not indicated their final response to this recommendation. • There is a significant increase in Class-IIIb and Class-IV lasers on the ALS floor; almost all of the new beamlines since the last MESH review have incorporated lasers with their operation. Equipment setup and configuration is often in progress at any time somewhere on the ALS floor, and the safety risk is much higher during these times. The MESH Team questioned the status of one observed laser operation, and only the EH&S Laser Safety Officer, who happened to be on the floor, could determine if the laser was on or off. • There is not an adequate system for indicating to users, maintenance personnel, and visitors that a specific portion of the beamline is online.

Division	Review	Noteworthy Practices	Opportunities for Improvement
Advanced Light Source (continued)			• Hazards vary from beamline to beamline. Workers at adjacent beamlines have no easy way of quickly determining what hazards are present a few feet away. Some method of identifying hazards at the entrance to each beamline should be considered. The MESH Team did not find controls to ensure those with access to beamlines have the required training, nor were they even aware of the hazards present. • Management inconsistently addresses concerns and recommendations made by staff. As noted by the RSC subcommittee, a Process Improvement Team (PIT) formed in 1999 made recommendations regarding a Facility Coordinator position and the work permit process. Another PIT formed in 2004 made similar recommendations, at which time the ALS appointed a Facility Coordinator, but did not implement a robust work permit process. The RSC subcommittee determined these recommendations were not addressed satisfactorily by management, leaving many ALS staff members with an impression of unresponsiveness by management. Only recently has the ALS acted on these recommendations by hiring a new Facility Coordinator. Another example involves inadequate enforcement of safety procedures.

Division	Review	Noteworthy Practices	Opportunities for Improvement
Chemical Sciences	Division SA	• CSD has taken an aggressive approach toward prevention of ergonomic injuries. All staff required to complete EHS0060 have done so. They have relied more on direct evaluations than on classroom training, to good effect. All computer workstations have undergone an EHS0068 evaluation. In addition, the Division has authorized ergonomic evaluations in research labs (e.g., glovebox operations). A number of recommendations resulting in changes in work practices have come out of these evaluations. CSD is instituting the development of computer docking stations in lab areas to mitigate ergonomic injuries that may result from using laptop computers in awkward situations and configurations.	• CSD had one environmental violation from the City of Berkeley for a chemical inventory inaccuracy.
	IFA	• Division Safety Coordinator's familiarity with research performed within the labs enhances his effectiveness as a DSC.	• HCl and HBr were added to the AHD as covered gases, but this was not reviewed by EH&S. This constitutes an unreviewed change in scope.
	MESH	• The Division requires and maintains an email list for all staff, including those on campus. This allows Division management to notify everyone of safety issues and policy changes. • The Division does a substantial amount of work at the ALS. It appears that the two Divisions work well together on EH&S issues, and they maintain clear lines of authority. • Professional ergonomic evaluations are performed for all admin. staff every two years, when their workspace has changed, or upon request. • CSD is actively working to augment laser safety training for campus-located staff to better ensure it meets the high standards of LBNL's laser safety program. This	• The ISM plan is not current. For example, the Division plan calls for everyone to take the JHQ, but only LBNL-located staff do so. Training statistics are high for the Lab site. However, there is no current system to assure that campus staff have taken their required training. A tailored JHQ or a tracking plan for campus courses would resolve this issue. • There appears to be some lack of adherence to requirements identified in authorization documents: (1) A laser was being installed and commissioned without a fully executed AHD. In addition, none of the laser operators had taken the newer and recently required laser safety course EHS0287 and EHS0289. These employees seem to not have been fully aware of these new requirements despite working in a Class 4 laser lab. (2) In the order of NO gas for an

Division	Review	Noteworthy Practices	Opportunities for Improvement
Chemical Sciences (continued)		effort included a supplemental course delivered by the LSO at a campus location. • The HERL facility has made substantial progress in clearing the legacy waste issues and working with EH&S personnel. • The Division's self-assessments, in which all LBNL-located PIs completed a detailed questionnaire about EH&S practices, was a good tool to communicate expectations to the PIs and also to document current practices in the various laboratories.	experiment covered under an AHD, a researcher tried to order a significantly larger quantity than the AHD allowed (40 times larger). • **Institutional:** There is a perceived two-class system, where campus work does not appear to have the same oversight. This was mentioned by staff at all levels. It appears that the LBNL safety requirements do improve safety, but individuals feel unsure about the benefits versus costs. Consistency might be addressed in a review of the MOU. • **Institutional:** While formal authorizations are prepared for high-hazard activities, there is no systematic assurance that low-hazard activities are reviewed and appropriately addressed.
Computing Sciences	Division SA	• Improvements in ergonomic awareness include the following: the Division created a safety walkthrough checklist that includes detailed questions regarding ergonomics and electrical safety; the Division maintained a high completion rate for EHS0060; early reporting of ergonomic pain is promoted via ergonomic resources on CS's safety Web page; staff have received individual attention by the Division Safety Coordinator and CS management; and ergonomics is a standing topic at all-hands meetings.	• Hazards inventory needs improvement, as not all workspaces are systematically reviewed for hazards. • CATS on-time completion rate was 88%.
Directorate/ Ops	Division SA	• Dir/Ops implemented a Safety Responsibilities MOU for all CSEE students participating in the program. A spreadsheet is utilized to track completion of the Safety MOU, JHQ completion, and any Work Plan that is applicable to the students' activities. Annotated in ISM plan.	• Training completion needs improvement. The FY06 completion rate was 89%.
Earth Sciences Earth Sciences	Division SA	• Utilization of the ESD Safety Review Questionnaire prior to approval of project approval is a noteworthy	• ESD's SAA management needs improvement. The Division's SAA compliance rate was 79%.

Division	Review	Noteworthy Practices	Opportunities for Improvement
(continued)		practice. • A revised work practice for pipetting was implemented as the result of an evaluation recommendation subsequent to a first-aid injury.	• The Division received an RWA noncompliance citation for activities that pre-dated the performance year. Corrective actions taken must be sustainable to prevent recurrence. • The Division needs to improve completion of required training, as the completion rate was 87%.
Engineering	Division SA	• Engineering piloted a new approach in its facilities with multiple supervisors. For example, in the B77 shops facility, all supervisors (1 superintendent and 3 supervisors) walked the entire complex together to observe and detect safety practices and conditions of each other's areas in addition to their own. Engineering performed a similar walkthrough in its B50A space and plans to continue this practice. • Following a complete third-party inspection of machine guarding commissioned by Engineering, the Division began modification/retrofit work in August 2005, and completed the process in January 2006. Staff have verified guarding completeness, maintenance, and use during routine walkthroughs. Noteworthy is Engineering's willingness to provide machine guarding inspection and retrofit services to other divisions' shops. • The Division stocks some ergo supplies for rapid response to equipment needs. Engineering funds ergonomic equipment needs for its employees in programmatic assignments when the program is unable to do so.	• Updating the hazards inventory information in HEAR fell short of 100% as the walkthrough inspection process was modified. A renewed effort is underway to have this updating performed by occupants for all Engineering space. • The Division relies on reviews of the Chemical Management System (CMS) to identify the presence peroxide-forming chemicals. Based on a CMS update status of 83%, the Division cannot adequately assess whether or not peroxide-forming chemicals have been introduced into its inventory.
EETD EETD	Division SA	• In order to address potential unique situations present in off-site work, EETD developed an Off-Site Safety Review form. • 100% of required EETD staff took EHS0060 training. The division completed workstation evaluations and associated corrective actions in a timely manner.	• **Institutional**: The DSC inspection of fume hoods serves as verification of EH&S Division certification and PI self-assessment check. During the PY, the DSC reported several cases of hoods out of their biennial or annual inspection schedule and/or with labeling deficiencies. Due to limited resources, these

Division	Review	Noteworthy Practices	Opportunities for Improvement
(continued)		• EETD's comprehensive program to address ergonomic needs includes an Ergonomic Action Plan, Ergonomics Committee, and in-house trained evaluators.	issues had not yet been addressed by EH&S as of the validation meeting. • While strides were made during the PY to improve regulated waste management within EETD, SAA compliance remains less than satisfactory. The Division received eight hazardous waste QA exception forms, indicative of poorly managed SAAs. • EETD should ensure that corrective actions taken to address programmatic deficiencies are effective. Actions taken during the performance year did not improve SAA compliance.
EH&S EH&S	Division SA	• The Radiation Protection Group's self-assessment is an effective methodology for documenting review and control of hazards.	• The Division incorporates ES&H into work planning. However, while satisfactory, EH&S Division's waste minimization efforts could be more aggressively pursued and better implemented. • Approximately 80% of Division space has been updated in the HEAR database. This serves as the primary inventory of Division hazards. Hazard review and control at the self-authorization level is not fully implemented across the Division. Two groups appear to have not completed this process during the performance year. • Authorization compliance, with SAA, radiological, and environmental violations, is a significant concern for EH&S. The Division should analyze causes and develop corrective actions as appropriate. • EH&S received three environmental violations from regulatory agencies: (a) DTSC cited the Lab for two Class II violations of the Part B Permit training program; and (b) while cleaning out a storm drain catch basin, Laboratory employees discovered an amount of mercury in the sediment exceeding the one-pound federal reportable quantity. The mercury

Division	Review	Noteworthy Practices	Opportunities for Improvement
(continued)			was believed to be legacy material in the catch basin sediment for at least 10 years. • The LCATS/CATS on-time completion rate was 85%. • Feedback and improvement process is not fully effective, as witnessed by the ongoing deficiencies regarding authorization compliance.
	IFA	• The RWA 1009 project took the initiative to develop an eight-page "User Survey SOP" detailing the steps required for routine user surveys of work and storage areas in their laboratory. Lab-wide use of a detailed User Survey SOP would result in documented surveys that indicate a well-controlled and managed work area and program. • The Technical Services Group lead requires Appendix A permits for below human hazard work carried out by the EH&S electronic technologists, demonstrating initiative that is beyond expectations, and promoting well-controlled and managed work practices.	• Drums and materials in storage racks higher than 4 feet are not on pallets. This requires personnel to be exposed to a fall hazard while accessing the storage shelf and while loading stored materials on a forklift pallet • Two storage cabinets containing liquid oxidizers and organic peroxides are anchored to the wall with drywall screws that would not hold the cabinets in case of an earthquake. • An electric forklift charger is sitting on the floor, not anchored, and permanently wired into the building power system with a flexible cord. • The trench cover gratings had been unfastened for cleaning and were missing. The gratings may not have the strength to support the full weight of the forklift.
Facilities Facilities	Division SA	• The PowerPoint presentation developed for waste minimization efforts is exemplary. • 100% of staff has completed EHS0060.	• For spaces owned and occupied by the Division, the HEAR database is current. However, hazard review for Facilities activities performed across the Lab is a patchwork of several different processes, depending on what is most appropriate for the activity performed. This patchwork appears to have gaps, as not all small jobs receive an adequate hazard review. • RWP violations are a significant concern. Corrective actions for these violations merit proper attention.

Division	Review	Noteworthy Practices	Opportunities for Improvement
(continued)	MESH	• In addition to the Lab requirement for new-hire orientation, the Facilities Division Safety Coordinator conducts a Division-specific orientation with new employees and some contractors to review Division safety policies, and to answer any questions the new employees may have. • The Facilities Division has a well-developed system of EH&S communications that employs a variety of tools to engage staff. The use of safety committees is effective, and all employees have the opportunity to participate if they desire. The Division uses safety awards, newsletters, and special activities (e.g., Safety Carnival and Material Handling Safety Fair) to engage staff in a meaningful, hands-on, and fun way. • The WOW program continues to be a great strength in the Division. Employee involvement in safety is encouraged, and management commitment to an open and collaborative environment, consistent with LBNL philosophy, is encouraged as well. The WOW program observations continue to identify safety issues at the lowest level and provide valuable training to many employees on safe work practices and good communications skills. • Recognizing that their staff perform highly hazardous work, the Facilities Division inspects their workspaces more frequently than other divisions and the Division Director provides a good role model and good leadership in conducting semi-monthly safety walkthroughs.	• Facilities received one NCAR for improper waste characterization. • The LCATS/CATS on-time completion rate was 55%. • The 2004 MESH identified that routine and repetitive jobs do not receive a hazard analysis. This continues to be a concern for the 2006 MESH review, in addition to a recent finding that the task hazard analysis process is not adequately defined or universally applied. The Division is relying too much on the experience of journeymen craft employees to substitute for hazard analysis processes. • A number of safety issues were identified during the walkthrough of Building 76. As in the previous MESH review, it continues to be a concern that some safety issues are not being corrected, even though the Division has several walkthroughs and inspection programs. A substantial number of safety noncompliances have been identified in the Facilities Division, and the process to actively close these noncompliances may not be adequate.

Division	Review	Noteworthy Practices	Opportunities for Improvement
Life Sciences	Division SA	• LSD safety training sessions are held twice as frequently as normal during the summer months.	• Authorization compliance, SAA and radiological, is a significant concern for the Division. The SAA compliance rate was 77%, and there were four RWA violations. • Students are explicitly mentioned in the training section of the ISM plan, but not in the staff accountability section. This is an opportunity for improvement.
	IFA	• A highly noteworthy example of an outstanding safety program and training document organization, and safety management was observed in one PI's lab. There are typically several to many safety administrative controls required for each operation in Life Sciences labs. Maintenance of records in one convenient and accessible location helps the lab staff maintain their controls, and demonstrates their understanding of the administrative requirements. • Another PI has developed an excellent set of training guidelines for personnel working under their RWAs. In addition to formal GERT and Radiological Worker training, lab-specific on-the-job training is conducted to ensure new lab team members and students are trained in the specific manipulations and controls in the conduct of their work.	• Formal Authorizations are covered in the Division's ISM Plan, but the Division's Safety Plan does not cover the full scope of Formal Authorizations and does not cover or reference in sufficient detail the Division's processes for identifying, tracking, managing, documenting, and updating authorizations. • LSD uses a Division-specific Job Hazards Questionnaire (JHQ) in an effort to tailor the questions to the needs of the Division. The LSD JHQ does not cover certain topics covered by the Lab-wide JHQ, and it asks different and fewer questions than those on the Lab-wide JHQ. Differences between the Life Sciences JHQ and Lab-wide JHQ may have contributed to training deficiencies in some cases. For example, Life Sciences JHQ questions related to biohazardous waste, biosafety, and bloodborne pathogens are different than those in the Lab-wide JHQ. Training course completion deficiencies represented the highest number of BUA appraisal findings. Life Sciences needs to validate its JHQ questions against the Lab-wide JHQ questions. • Biological work opportunities for improvement include:

Division	Review	Noteworthy Practices	Opportunities for Improvement
Life Sciences (continued)			– Training deficiencies in Medical/Biohazardous Waste and General Biosafety and/or Bloodborne Pathogen courses – Lab-coat laundering and storage – Labeling equipment with biohazard labels – Exposure Control Plans – Hepatitis B medical surveillance • The AHDs cover hazardous gas and reactive chemical use. Findings were noted pertaining to: – Maintenance of current information in AHD – Health-hazardous gas storage – Eyewash/safety shower location – Open fire door
Materials Sciences	Division SA	• MSD recycled large quantities of wood and cardboard from unpacking new equipment during the Molecular Foundry start-up. • The Division extensively modified EHS0026 to reflect Division priorities and needs, and PIs presented the class to foster greater involvement and acceptance. • Notable was MSD's approach when the Division discovered four cases in Building 66, in which one of the fume-hood sash support cables had broken, and the sash was supported by a single wire, suggesting that the wires had reached the end of their reliable life cycle. MSD inspected all of the hoods' sash wires in the building. No additional failures were noted, and the issue was added to the annual self-assessment process. • To improve chemical tracking at the Molecular Foundry,	• Work proposed for the Molecular Foundry undergoes thorough review by the MSD EH&S Manager EH&S Division subject matter experts, as needed. Review of work in other laboratory operations and updates of the HEAR database require improvement in some areas. • Administrative controls for AHD compliance need improvement, as the Division struggled with overdue reauthorizations, document control, and compliance with authorization requirements (i.e., work control and training). • Maintenance of an accurate chemical inventory needs improvement. • The laser safety assessment completed in December 2005 identified widespread laser safety issues in MSD. Program improvements implemented by the Division

Division	Review	Noteworthy Practices	Opportunities for Improvement
Materials Sciences (continued)		MSD identified six lead scientists as responsible persons, and granted proxy access to others under their lead. The goal is to reduce the likelihood of neglected tracking that is inherent when chemicals are assigned to transient employees such as guests and students. • The Division developed and disseminated lessons learned, both internally and to the Lab-wide population.	must be effective and sustainable. • SAA compliance needs improvement. The compliance rate for FY06 was 68%. • JHQ completion needs improvement. The completion rate for FY06 was 86%.
	IFA	• There is a strong commitment at the upper levels of MSD administration to providing resources for managing environment, safety, and health matters within the Materials Sciences Division. Within the last 18 months, the Division has hired a professionally credentialed EH&S and Facilities Manager, a part-time EH&S Administrator, and a full-time EH&S Technician. This commitment reflects the Division's recognition that the variety and complexity of ES&H needs within the Division exceed the support capabilities of the institutional ES&H programs, but must be met so that safe and valuable work can continue. • In general, compliance with requirements for work with radioactive materials or radiation-producing machines is excellent. Users recognize that radioactive materials present hazards that are outside of those typically encountered in their work, and take special care to adhere to safe work practices and proper documentation of the work.	• Conformance with requirements to include all hazardous materials in the Chemical Management System (CMS) is variable. Previous reviews conducted have noted that some laboratories are excellent, while some laboratories are not. Specifically, many laboratories reviewed did not have gas cylinders included in their inventories. Previous reviews of CMS compliance conducted internally by Materials Sciences Division have noted a wide range of compliance for other types of chemical containers as well. • With specific exceptions (especially in the area of radioactive materials and radiation-producing machines), researchers within the Materials Sciences Division, and by extension Materials Sciences management, do not seem to appreciate that a formal authorization is absolute: it constitutes permission to conduct an operation under a specified set of conditions. If the conditions in that authorization do not reflect actual conditions, work must stop until the authorization properly reflects conditions. Numerous examples were noted during the appraisal. • Compliance with hazardous waste requirements

Division	Review	Noteworthy Practices	Opportunities for Improvement
Materials Sciences (continued)	MESH	• The Division has a periodic newsletter (Materials Safety) that is sent to all employees stressing safety in the workplace and summarizing lessons learned and recent safety accidents. • The Division is preparing a safety calendar that details the list of safety inspections, due dates for formal and informal (re)authorizations, etc. The MESH team suggests coordinating these activities with the Performance Review and Development (PRD) process. • MSD has taken significant steps to increase staffing of their safety program in the past year, hiring a new division safety coordinator, safety technician, and building manager. The division safety coordinator is a full-time, career safety professional, replacing an MSD researcher who performed the duties on a part-time basis. • The Division is re-implementing fines against grants for SAA violations. • The Division has used disciplinary action against employees for safety violations, some resulting in salary reductions. • The Division Safety Coordinator provides input to the P2R process on safety performance of each PI. This input constitutes 10% of the grade for the purposes of salary ranking.	continues to be problematic (waste management issues were noted in both the 2000 and 2003 Integrated Functional Appraisals). • **Institutional Concern:** Several MSD senior staff members mentioned the high cost of the Facilities Division's equipment installation. For example, laser interlocks were originally estimated at $20,000 per room, including one week's engineering labor. These costs were eventually lowered to ~$7,000 per room after negotiations with Facilities. Facilities' cost and labor estimating process should be reviewed, or a mechanism to bring in outside vendors should be pursued. • Except for the Molecular Foundry, the laboratories visited by the MESH team were mostly devoid of permanent LBNL staff. This places undue responsibility for day-to-day lab management on students and postdocs. For example, one graduate student was assigned by his advisor as the safety coordinator for his group. This requires periodic review of 12 laboratories, and occupies 5–10 hrs of his time per week. This is an inappropriate responsibility for a single graduate student. • The Division ISM plan was last updated and approved in 2002. A draft from 2004 was submitted to the EH&S Division, but never formally approved. EH&S provided comments, but no final resolution occurred. • The MSD safety coordinator is delaying putting up door-entry signage on labs (both at TMF and the older buildings within the MSD) pending a redesign of the signs. This is a clear violation of the Chemical Hygiene and Safety Plan (CHSP). • Equipment in a number of labs are bolted down and configured to result in a less-than-28-inch aisle width.

Division	Review	Noteworthy Practices	Opportunities for Improvement
Materials Sciences (continued)			• The process of fining researchers for Satellite Accumulation Area (SAA) infractions appears to have merit, but it does not sustain a culture where ES&H is an important part of conducting the work. MSD began issuing fines a few years back, but suspended this penalty in the past year. SAA compliance improved when fines were actively issued, but the incidence of SAA noncompliance returned to pre-fine levels after the fine program was stopped. • The number of noncompliant SAAs has grown in the past year. Of the ~50 SAAs inspected four times in the last year, three were noncompliant on three out of four occasions, and 10 failed in half the inspections. • A lecture-size bottle of nitrogen dioxide was found in a nonventilated experimental apparatus in B66-407. Two deficiencies are related to this condition: (1) no AHD exists for use of this gas, and (2) it is not inventoried in the Chemical Management System. • Some Supervisors Accident Analysis Reviews (SAARs) were incomplete or contradictory. • The MESH team also identified 34 workspace safety concerns.
Nuclear Science	Division SA	• The NSD has an improved safety program in large response to last year's self-assessment. The frequency and regularity of ES&H meetings could still be improved, but the addition of ES&H as an agenda item in all division meetings, at all levels, helps maintain a proactive program. • NSD experienced a seamless transition following the retirement of the Safety Coordinator. • The increasing level of activity in safety matters of senior	• There were two Level-2 RWA noncompliances: one resulted from work on the inflector at the 88-Inch Cyclotron, and one involved legacy targets. Corrective measures were implemented.

Division	Review	Noteworthy Practices	Opportunities for Improvement
Nuclear Science (continued)		management, the safety committees, and most importantly of line managers helps to ensure that hazards are identified and controls are initiated and maintained. NSD has backed up this commitment with checklists and the Project Safety Questionnaire.	
Physical Biosciences	Division SA	• The Division implemented a major recycling initiative and joined the VWR pipette tip recycling program, which recycles the tip holders (also plastic). The plastic holders were previously disposed of as regular trash. • PBD inspected all Division spaces in response to the safety walkaround mandate, and most PIs attended. In cases where the PI was unable to participate, a safety representative conducted the inspection and the Safety Planning Team followed up with the PI. To encourage continued reviews, PIs and group safety reps were asked to periodically complete simple checklists, each of which had a different focus. • All employees are asked to inspect spaces every March using a detailed self-assessment checklist. The completed checklist is used as a ticket for admission to the Division's annual safety picnic, which includes giveaways and displays by safety-related vendors. • Ergonomics is discussed at every Division safety meeting. PIs are reminded to address ergo issues in the workplace, and the observation of ergonomic issues is a PI walkthrough checklist item. • PBD asked all its employees, via the self-assessment questionnaire, if they were experiencing ergo-related pain. Three responded affirmatively, and evaluations were performed.	• Authorization compliance, SAA and radiological, is a concern for the Division. The SAA compliance rate was 80%, and two RWA noncompliances resulted in a Level-2 RWA violation.

Division	Review	Noteworthy Practices	Opportunities for Improvement

Physics	Division SA	• The Safety Committee conducted a vertical-slice safety interview in early May. The slice included GSRAs, students, guests, employees, and group leaders. • Best management practices include biennial training and orientation for students, and the ES&H Responsibilities and Expectations information sheet. • Seamless transition following retirement of long-standing Division Safety Coordinator.	• Training completion needs improvement. The completion rate for FY06 was 83%
	IFA	• Consistent, documented method for on-the-job radiation safety training. • By using CMS to keep an accurate inventory of process chemicals, the PI for the Microsystems Lab knows when to order more process chemicals without doing a physical check on the inventory. This is an excellent method to satisfy both needs to maintain sufficient chemical supplies, and to keep an accurate chemical inventory for EHS purposes.	• One matrixed staff with expired respirator training. • An AHD required Fire Department training, and no training had taken place in several years. • Four workspace safety deficiencies were noted.
Genomics	Division SA	• The JGI Safety Committee is active, and is proactive in many topics and areas. The membership includes project leaders, managers, research associates, and postdocs. The Committee set up an Ergonomic Working Group to focus specifically on reducing injuries in the workplace – a major safety issue for the JGI. Another subcommittee, the Safety Culture Working Group, encourages employee input and suggestions, and acts as the major source for feedback at the working level for dissemination of lessons learned and other ES&H information. • The JGI/East waste minimization program has been effective in reducing waste by over 200 gallons in one program.	• Safety communications at Genomics West need improvement, as they do not receive any communication from the rest of the Division. • Authorization compliance, SAA and radiological, is a concern for the Division. SAA compliance rate was 65%, and there was one Level-2 RWA violation. • Genomics did not adequately address all programmatic opportunities for improvement identified in FY05. Specifically, a MESH recommendation to integrate the safety program of the units comprising JGI was echoed in the PY06 self-assessment validation report.
Genomics (continued)		• Emphasis on the need and the value of PPE is a major component of the new employee safety awareness	

Genomics (continued)	IFA	program. • Ergonomic issues have been addressed with a vigorous multifaceted approach that includes training, evaluations, continual reinforcement communications, and workplace engineering improvements. • JGI staff have a dedicated laser service area (e.g., light curtains) to service the MegaBACE units. Use of laser curtains blocks potential laser radiation from other areas and precludes other occupants from having to participate in laser controls. • The JGI Facilities group keeps excellent records in binders of the permits it issues (e.g., Energized Electrical Work Permits, Surface Penetration Permits, Lockout/Tagout). Permits and authorizations were very well organized, easily accessible, filled out completely, and had the proper signatures.	• The Genomics Division needs to better identify, document, and monitor the types of authorizations and permits identified. The scope of work that is authorized in the Genomics Division ISM Plan is fairly generic and does not cover or reference the range of hazardous work, authorizations, and permits; or provide sufficient detail for management to know what work is authorized or permitted, and the form of the authorization or permit. • The HEAR system is being used for work at the JGI/PGF, but not for work at Building 84. • Genomics needs to specify the tracking system for Building 84 work (e.g., in the Division ISM Plan) or start using the HEAR system for Building 84 work. • There is no lab-coat laundry service. • The tag on the emergency eyewash in 84-211 indicated that the eyewash was not being tested quarterly, and an "eyewash" sign was not posted. • The autoclave logs did not have current records that biological indicators had been used to test the autoclave's efficiency (i.e., sterilization). • JGI chemical users are not widely taking routine responsibility for keeping the chemical inventory for their area updated as chemicals are added and disposed. • Quarterly inspections for the 4,000-gallon aboveground storage tank are not maintained.

			• The new JGI Safety Coordinator and JGI Facilities Manager do not have spill-prevention training. • The two engine generators at JGI do not have an engine generator operating log that meets the requirements of the BAAQMD. The inspection reports provided by Peterson Power Systems do not meet the BAAQMD requirements. • Applied Biosystems laser units are serviced by an outside vendor. This vendor work is not covered by the AHD, and the vendor does not follow the controls listed in the AHD. • Five SAA issues were discussed with the responsible person. • The scope of work that is authorized in the Genomics Division ISM Plan is fairly generic, and it does not cover or reference the range of hazardous work, authorizations, and permits, or provide sufficient detail for management to know what work is authorized or permitted and the form of the authorization or permit.

Appendix D
List of Acronyms and Abbreviations

AFRD	Accelerator and Fusion Research Division
AHD	Activity Hazard Document
ALS	Advanced Light Source
CATS	Corrective Action Tracking System
CSD	Chemical Sciences Division
DART	Days Away from work and Restricted Time
DOE	Department of Energy (U.S.)
EETD	Environmental Energy Technologies Division
EH&S	Environment, Health, and Safety Division (LBNL)
ESD	Earth Sciences Division
ES&H	Environment, Safety, and Health (DOE term)
HEAR	Hazards, Equipment, Authorizations, and Review System
IFA	Integrated Functional Appraisal
ISM	Integrated Safety Management
JHQ	Job Hazards Questionnaire
LCATS	Laboratory Corrective Action Tracking System
LSD	Life Sciences Division
MESH	Management of ES&H
MOU	Memorandum of Understanding
MSD	Materials Sciences Division
NCAR	Nonconformance and Corrective Action Report
NSD	Nuclear Science Division
OCA	Office of Contract Assurance
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
OSSEP	Off-Site Safety and Environmental Protection Plan
PBD	Physical Biosciences Division
PI	Principal Investigator
PPE	Personal Protective Equipment
QUEST	Quality Assurance/Improvement and Environment, Safety, and Health through Self-Assessment and Teamwork
RWA	Radiological Work Authorization
RWP	Radiological Work Permit
SAA	Satellite Accumulation Area
SAAR	Supervisor Accident Analysis Report
SRC	Safety Review Committee
TRC	Total Reportable Cases
UCB	University of California at Berkeley
UCOP	University of California Office of the President
WOW	Workers Observing Workers
XA	X-ray Authorization